WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

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* FUTURE PROGRAMS - MARSHALL SPACE FLIGHT CENTER

Here is a summary of some major future contract opportunities as outlined to contractors during the past week at the Marshall Space Flight Center, National Aeronautics and Space Administration, Huntsville, Alabama.

Future Projects Office, directed by H. H. Koelle, expects to spend $3.1 million this fiscal year for studies of advanced, integrated space vehicles and transportation systems. In all, about 28 contracts will be awarded in the $50,000 to $200,000 range.

Study Contracts tentatively planned include:

✓ General: Launch vehicle size and cost analysis, study of trends in launch vehicle guidance and control systems, design study of homing systems for orbital rendezvous.
✓ Saturn Launch Vehicle Class: Studies on the Second Saturn C-2 configuration, conceptual design studies on launch vehicles with two to three million pounds of thrust with fully-recoverable stages as a design objective.
✓ Nova Launch Vehicle Class: Study of launch vehicle configurations in the six to twelve million pound thrust class.
✓ Nuclear Upper Stages: "Early" nuclear flight vehicle design study; preliminary design study for a nuclear third stage in an advanced version of the Saturn rocket.
✓ Orbital Operations and Advanced Transportation Systems: Flight performance manual for orbital operations; design criteria for orbital operations and systems; design criteria and propulsion systems for orbital launch vehicles; and design criteria for lunar and planetary launch vehicles.

Future contracts connected with the Saturn program include:

✓ Saturn C-2: Specifications for a new Saturn stage, are now being prepared. A bidders conference will be held at Huntsville next Spring, to initiate competitive proposals which will be evaluated late next year. The new stage will employ a cluster of four 200,000 pound engines now under development.
✓ Transportation: First stage of the Saturn vehicle will have to be transported by barge to the Cape Canaveral launch site. Other plans are under consideration for the second stage, which is 18 feet in diameter and 40 feet long. One proposal is to adapt an airplane to fly this stage "piggyback" since it is too large to fit into any cargo compartment.
✓ Fabrication: The Marshall Center is now fabricating and assembling the Saturn first stage. However, this year the Center will start to contract for part of the major structural assemblies and eventually all major structural items will be produced by industry.
✓ Components: One of the "major opportunities for manufacturers" lies in the design of components for use in the liquid oxygen-liquid hydrogen upper stages of Saturn, and in the nuclear rocket using hydrogen as a working fluid.

* RADIATION RESISTANT SOLAR CELL

Development of a solar cell resistant to high energy radiation damage is described by the Army Signal Corps as the most important advance in this field since the first solar cell was produced in 1954. It is suggested that techniques used in producing the cells may be useful for development of other radiation-resistant electronic devices for military and civilian applications.

✓ Layers Reversed - The new cells, made of silicon, are similar to conventional types in appearance, while the active layers are reversed. This is accomplished by diffusing phosphorous into the surface of a "p" type silicon crystal, whereas present cells are made by diffusing boron into an "n" type silicon crystal.

✓ Radiation Resistant - While the new "n-on-p" cells convert sunlight directly into electricity in the manner of standard "p-on-n" types they have shown an ability to withstand exposure to higher energy ionizing radiation for more than ten times as long as current cells. According to the Army, the vulnerability of conventional cells to radiation damage would seriously limit operating life under conditions of prolonged exposure to radiation in space, such as the Van Allen belts.

✓ Other Advantages: The new cells are produced at a lower temperature than employed in producing present types. This milder environment is said to cause less damage to the internal crystal structure, so that fewer cells are rejected. For this reason, cells of higher performance may be produced at lower costs. The exact mechanism that gives these cells their unique properties is now under study.

The Army suggests that this development, in addition to its importance in space applications, may open the way to techniques for producing highly resistant transistors, diodes and other semiconductor devices basic to military and civilian electronic equipment. New semiconductor devices which are less vulnerable to atomic radiation would be of value, the Army states, in future military electronic equipment that might be subjected to radiation accompanying an atomic attack.

✓ Further information, including details of the manufacturing process is promised to the American electronics industry "in the near future." The information will be made available by the U. S. Army Signal Research and Development Laboratory, Ft. Monmouth, N. J.

(R&D by William Cherry and Joseph Mandellorn, Ft. Monmouth. Special tests and measurements by RCA Laboratories, Princeton, N. J.; Transitron Electronic Corp., Wakefield, Mass. and Space Technology Laboratories, Los Angeles)

* TARGET INTERCEPT COMPUTER

A Target Intercept Computer designed and developed by Remington Rand - Univac with the cooperation of Bell Telephone Laboratories has been installed at the Army's White Sands Missile Range.

The computer is designed to receive radar information on the position, speed and direction of incoming missiles and then to dictate a precise launching time and guidance instructions for the Nike-Zeus anti-ICBM missile. Although the computer contains nearly 175,000 basic components, modular construction is employed, making possible replacement of a basic unit in less than five minutes. An input-output section allows communication with humans or with radar or other external digital equipment. The control section directs the operation by decoding instruction words into computer language and commanding the rest of the computer to follow these instructions.

□ PRINTED CIRCUIT LAYOUTS: An IBM-704 computer program known as Redcross (Reduce Crossings) has been developed by the Sandia Corp. under AEC contract for assistance in the layout of printed circuit wiring diagrams. Although no claim is made that circuit layouts can now be completely handled by a computer program, the system has made it possible to lower the number of man-hours normally required to reduce a circuit to its optimum form.

(Technical Details Available through AEC channels or Write OTS, U. S. Department of Commerce, Washington 25, D. C. for Pub. SCTM 201-60 (24). 12 Pages. 50 Cents.)

□ OPTICAL PROPERTIES OF CONDENSED GASES: The National Bureau of Standards has developed a method that makes possible a determination of the optical constants of gases condensed at low temperatures. In the procedure, the refractive index of a substance is found by comparing data derived experimentally with data processed by an automatic computer. The gases investigated include argon, carbon dioxide, krypton, neon, nitrogen, oxygen and water.

(For details, write National Bureau of Standards, Office of Technical Information, Washington 25, D. C.)

□ LITHIUM HYDRIDE ANALYSIS: Navy researchers, working with lithium hydride, have developed a method for overcoming difficulties experienced because of the activity of the compound in a moist atmosphere. The particular problem was a determination of the available hydrogen and lithium in the same specimen. The use of gelatin capsules was found to make possible the sampling, weighing and transporting of small samples without decomposition. Analysis was based on the evolution of hydrogen from lithium hydride in the presence of water. Hydrogen is collected by displacement and the resulting alkaline solution is titrated with standard acid.

(R&D by G. A. Picklo, Jr., Metallurgy Division, Analytical Chemistry Branch, U. S. Naval Research Laboratory, Washington 25, D. C.)

□ TRANSISTORIZED COMMUTATOR: Studies for the Air Force at Massachusetts Institute of Technology have resulted in development of a completely transistorized, four-segment electric commutator said to be capable of switching power loads of up to 600 watts. The studies were part of a program to find a substitute for mechanical commutators in high-speed, high-altitude aircraft. Tests were judged successful but it is suggested that more work must be done -- especially on solid state switching devices -- before the electronic commutator will be practical for moderate and high-power machines.

(Technical Report Available. 47 Pages. $1.25. Write OTS, U. S. Department of Commerce, Washington 25, D. C. for PB 161 721 -- Transistorized Four Segment Commutator.)

□ TENSILE TESTS OF METALS: NASA researchers believe that short-time elevated-temperature tensile tests of metals, made under head-speed conditions are not desirable from the standpoint of insuring uniform test results. Instead, they recommend a strain rate of 0.005 per minute up to yield load, and a rate of 0.05 per minute for the region from yield to fracture.

(For details request TN D-420 from NASA, CODE BID, Washington 25, D. C.)

PUBLICATION CHECKLIST

- ☐ NOISE, the complete text of testimony, statements and exhibits presented to a congressional committee looking into the many problems of acoustics involving the aircraft and missile industries. Contains much information on company programs. 260 Pages. Single Copies Free. (Write Committee on Science and Astronautics, New House Office Bldg., Washington 25, D. C. for Hearings No. 13 -- Noise: Its Effect on Man and Machine)

- ☐ BRAZING FOR HIGH-TEMPERATURE SERVICE, a March, 1960 report by the Defense Metals Information Center and now available. Summarizes available technical information on the brazing process and the brazing filler metals used to join high temperature materials. 12 Pages. 50 Cents. (Available through military channels or from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ☐ FRONTIERS IN OCEANIC RESEARCH, statements, testimony and exhibits presented earlier this year to a congressional committee describing various U. S. and Soviet programs in the field of oceanography and possibilities for further developments in this field. 76 Pages. Single Copies Free. (Write Committee on Science and Astronautics, New House Office Building, Washington 25, D. C. for Hearings - No. 7 - Frontiers in Oceanic Research)

- ☐ STANDARD ATMOSPHERES, presents a family of Standard Atmospheres for defining vertical variations of temperature and pressure. These approximate mean conditions over Eurasia, as deduced from limited climatological data. 36 Pages. $1. (SCR-183 available through AEC Channels or at $1 from OTS, U. S. Department of Commerce, Washington 25, D. C.)

- ☐ FRONTIERS IN ATOMIC ENERGY RESEARCH, statements, testimony and exhibits from a wide variety of sources on many problems and opportunities in atomic energy "frontier" developments including controlled thermonuclear reactions, space propulsion, energy conversion and similar fields. Excellent background. 380 Pages. Single Copies Free. (Write Joint Committee on Atomic Energy, F-88, The Capitol, Washington 25, D. C. for Hearings -- Frontiers in Atomic Energy Research)

- ☐ LEONARDITE, a study of this coal-like substance which may become an important future source of chemicals. 10 Pages. Single Copies Free. (Write Publication-Distribution Section, U. S. Bureau of Mines, 4800 Forbes Avenue, Pittsburgh 13, Pa. for Report of Investigations No. 5610)

- ☐ METEOROLOGY ON THE MOVE, a progress report on efforts to gain increased support for meteorological training and facilities. Includes a discussion of current research problems. 30 Pages. Single Copies Free. (Write Publications Office, National Academy of Sciences, 2101 Constitution Avenue, N. W., Washington 25, D. C. for NAS Pub. No. 794)

- ☐ NASA SEMIANNUAL REPORT, a report to Congress on programs of the National Aeronautics and Space Administration for the period ending March 31, 1960. Covers the highlights of many research and operating programs. 272 Pages. Single Copies Free. (Write Information Office, NASA, 1520 H Street, N. W., Washington 25, D. C. for NASA Third Semiannual Report)

Special Supplement

AIR FORCE WEAPON SYSTEM DIRECTORY

Here is the latest official listing of chairmen of weapon system panels or working groups established by the Air Force in Washington:

Panel/Working Group	Chairman	Telephone
STRATEGIC PANEL	Col. I. J. Klette	Ox 5 2616
B/RB-47	L/Col. L. T. Shuler	Ox 7 2020
B-52	L/Col. J. R. Risher	Ox 7 4095
B-58	Maj. O. A. Prater	Ox 7 2020
B-70	L/Col. R. J. Hertz	Ox 5 6234
KC-97/KC-135	L/Col. E. J. Saliba	Ox 7 4095
ANP (CAMAL/WS-125A)	Maj. P. P. Taylor	Ox 7 4636
SNARK (SM-62)	Maj. J. T. Patrick	Ox 7 5736
QUAIL (GAM-72)	L/Col. R. F. Pike	Ox 7 3810
HOUND DOG (GAM-77)	Col. G. F. Hammett	Ox 5 2288
SKYBOLT (GAM-87A)	L/Col. J. W. Cotton	Ox 5 6234
ATLAS	L/Col. M. L. Seccomb	Ox 7 3810
TITAN	L/Col. F. S. Porter	Ox 7 9926
THOR/JUPITER	Maj. D. W. Burrows	Ox 7 5735
MINUTEMAN	L/Col. J. H. Hobaugh	Ox 7 5415
ADVANCED SYSTEMS	Col. W. R. MacDonald	Ox 7 2671
465L (SAC CONTROL)	L/Col. R. S. Jensen	Ox 7 3684
SUPPORT PANEL	Col. A. R. Brousseau	Ox 7 7792
431L (Air Traffic Control)	Col. M. R. Peterson	Ox 5 7473
433L (Weather Observing & Forecasting)	L/Col. L. W. Cowan	Ox 7 3684
438L (Intelligence Data Handling)	Mr. W. J. Becker	Ox 7 5651
463L (Materials Hndlg)	L/Col. J. A. DeVries	Ox 7 5651
473L (Cmd Control)	L/Col. A. P. Ash	Ox 5 6210
480L (AF Communications)	L/Col. E. G. Kar	Ox 5 4718
Control Systems Integration	Mr. W. J. Becker	Ox 7 5651
AIR DEFENSE PANEL	Col. R. G. Taylor	Ox 5 3235
F-102	Maj. H. L. Warren	Ox 7 7820
F-101B	Maj. G. H. Morris	Ox 7 7593
F-106	Maj. H. L. Warren	Ox 7 7820
F-108	Maj. D. Andre	Ox 5 3728
IM-99A (Bomarc)	Maj. M. O. Weber	Ox 7 7820
IM-99B (Bomarc)	Maj. W. B. Baxter	Ox 7 3368
Space Counter Weapon System	Maj. W. B. Baxter	Ox 7 3368
Control & Warning	Col. A. R. Shiely	Ox 7 2971
MIDAS	Maj. J. Sides	Ox 7 3314
BMEWS (474L)	Maj. H. T. Eldridge	Ox 7 7820
SPACE TRACK	L/Col. L. F. Mathison	Ox 7 8527
NORAD COC (425L)	L/Col. R. S. Jensen	Ox 5 6210
SAINT	L/Col. E. R. Feicht	Ox 7 1727
PROGRAM REVIEW COMMITTEE	B/Gen. R. W. Fellows	Ox 5 2311

TACTICAL PANEL	Col. R. W. Gates	Ox 5 2656
F-100	L/Col. R. F. Kenney	Ox 7 7553
F-104	L/Col. R. F. Kenney	Ox 7 7553
F/RF-105	L/Col. J. J. Hancock	Ox 7 4673
FX/STOL	L/Col. A. J. Ritchey	Ox 7 6687
KB-50J	L/Col. J. P. Kellsey	Ox 7 7553
TM-61C/TM-76A/TM-76B	L/Col. R. A. Bellan	Ox 7 4673
C-123/C-130	Maj. H. D. Ehrlich	Ox 7 8407
GAM-83	Maj. H. E. Wells	Ox 7 7891
412L (Air Weapons Control)	Maj. S. T. Major	Ox 7 3808
Military Asst Program	Col. E. J. Stealy	Ox 7 7127
BW/CW	Maj. J. E. Hicks	Ox 7 3969
RECONNAISSANCE PANEL	Col. F. W. Dyer	Ox 7 7990
SAMOS	Col. J. A. Shannon	Ox 7 7990
RF-101	Maj. C. H. Rigsby	Ox 7 7967
CER Intelligence	L/Col. O. J. Schulte	Ox 5 2032
APCS	Maj. J. M. Sarto	Ox 7 4063
B-RB-66	Maj. C. H. Rigsby	Ox 7 7967
ASTREC	Maj. G. K. Dicker	Ox 7 3602
466L	L/Col. L. W. Cowan	Ox 7 3684
TRAINING PANEL	Col. H. A. Stevenson	Ox 7 7914
T-29	L/Col. H. Massengale	Ox 6 9304
T-38	Maj. E. Stringer	Ox 5 4908
T-37/T-33	Maj. O. W. Kuhlman	Ox 6 9234
T-39	L/Col. C. E. Good	Ox 7 8865
Drone	L/Col. M. J. King	Ox 7 2150
Target	L/Col. M. J. King	Ox 7 2150
TRANSPORT PANEL	Col. H. A. Stevenson	Ox 7 7914
C-140 (UCX)	Maj. L. T. Greenwood	Ox 5 5160
SOR-182	Maj. E. M. Stringer	Ox 5 4908
In-Service Transport	L/Col. P. F. Patch	Ox 7 8407
Rotary Wing	Maj. J. F. Miller	Ox 7 7973
RVX/SC-130/VSTOL	L/Col. A. G. Glauch	Ox 7 1029
Special Air Missions	Maj. K. L. Christensen	Ox 5 6848
C-130E/C-135	L/Col. A. G. Glauch	Ox 7 1029

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